*****Not Read*****

Trend Study 6-6-96

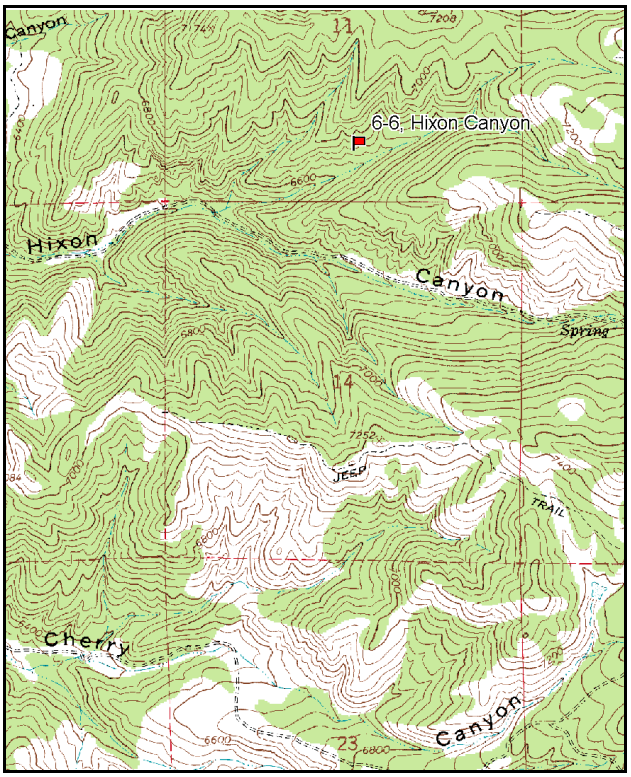
Study site name: Hixon Canyon . Vegetation type: True Mountain Mahogany .

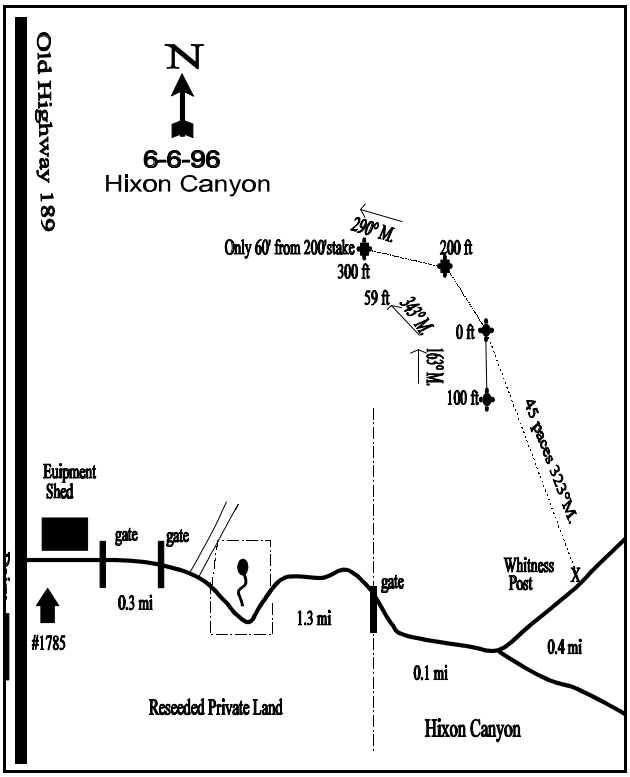
Compass bearing: frequency baseline 146 degrees magnetic.

Frequency belt placement: Line 1 (11 & 95ft), line 2 (34 & 76ft), line 3 (59ft).

LOCATION DESCRIPTION

From 1875 Old Highway 189, travel east up Hixon Canyon on a dirt road through a gate and proceed 0.3 miles to another gate. Turn right and proceed 1.3 miles to a fence with a gate. Continue 0.1 miles and turn left at the fork. This road is only shown as an intermittent stream on 1967 quad map. Proceed 0.40 miles to a white topped green steel fence post stake in a rockpile. From the rockpile, walk 45 paces at 323 degrees magnetic to the 0-foot stake of the baseline marked by browse tab #7966. The baseline runs 146 degrees. The rest of the baseline runs off the 0-foot baseline stake. Line 2 runs 326 degrees magnetic. Line 3 runs 288 degrees magnetic.





Map Name: Crandall Canyon

Diagrammatic Sketch

Township 1N , Range 5E , Section 11

UTM 4519983 N 470604 E

DISCUSSION

Trend Study No. 6-6

*******This study was not read in 2001 because project personnel could not gain access through private land. The study will be reevaluated during the next rotation. The site narrative and data tables are included from the 1996 volume 2 Utah Big Game Range Trend Studies report.

The Hixon Canyon study was established in 1984. This site is located in the upper reaches of Hixon Canyon at 6,680 feet in elevation. It samples a mixed mountain brush type on moderately steep (20-25% slope), south-facing terrain. Although it lies higher up the canyon than the old line intercept transect it replaced, this study is still within the limits of critical deer winter range. Browse utilization appears to be moderately heavy, but this appearance is exacerbated by extended drought. Pellet group frequency for deer appears to indicate moderate use (17%), with elk pellet groups displaying only light use (3%). Domestic sheep and cattle also utilize the site. There was significant use of Indian ricegrass noted in 1984.

Soil is red in color and appears to be highly erodible. Most surface rock and herbaceous plants are pedestaled. Soil texture is a sandy clay loam with a soil reaction that is moderately alkaline (7.9 pH). Percent organic matter in the soil is the lowest of all sites in the management unit at only 1.7%, where the average for the unit is 3%. The range for percent organic matter for Utah is generally from 1.5 to 5.0%. Drainage and permeability are probably quite rapid. Effective rooting depth (see methods) is moderate at a little over 12 inches. Soil temperature at this depth is about 66° F with a moderately rocky soil profile. Percent bare ground was originally quite high at 39% (1984) and now is about 18% in 1996. The ratio and distribution (nested frequency) of protective ground cover (vegetation and litter cover) to bare ground is considered only fair with a value of 1:2.8. A value of 1:3 or higher usually affords moderately good protection from high intensity summer storm events. Consequently, the erosion rate is moderate and continuing soil loss is a problem.

This site, like many mountain brush types, has a plant composition that is quite variable according to the availability of microsites. On much of the area, the key browse species (true mountain mahogany and mountain big sagebrush) and juniper provide the vegetative aspect for the community. In terms of abundance however, they provide 2%, 23%, and 56% of the browse cover respectively. From 1984 and 1990, it appeared that broom snakeweed was going to take over the site with a population that had increased to more than 22,000 plants/acre. Since then, the population is estimated at only 740 plants/acre. The drought has obviously had a detrimental effect on its density. Now only 3% of the browse cover is contributed by broom snakeweed. Both of the preferred "key" species, as well as the less abundant Saskatoon serviceberry and mountain snowberry, have sustained heavy use which has been intensified by prolonged drought. Utilization coupled with drought has effected the vigor and age structure of mountain big sagebrush and true mountain mahogany. Even stickyleaf low rabbitbrush, a species that seldom is utilized, shows moderately heavy use. Almost all of the browse populations mentioned above, but especially the key species, have excessively decadent age structures. What is most alarming on this site is the proportion of dead plants in the populations of mountain big sagebrush and true mountain mahogany at 55% and 29% respectively.

The herbaceous understory contributes little quality forage, and the majority comes from cheatgrass. Plants occur erratically and appear to be greatly effected by soil erosion. Many of the shrub interspaces are bare soil and rock. The most numerous perennial species are Sandberg bluegrass, bluebunch wheatgrass, and Indian ricegrass which are important forage species. All show evidence of considerable current utilization.

1984 APPARENT TREND ASSESSMENT

Soil is derived from conglomerate parent material and thus is highly erodible. Heavy animal use is contributing to conditions that favor rapid soil erosion, which in turn adversely affects vegetative potential. Soil trend appears down. Vegetative trend also appears to be declining due to decadent age structures and excessive browsing on the key browse species, and an apparent increase of undesirable shrubs such as broom snakeweed and prickly pear cactus.

1990 TREND ASSESSMENT

The key browse species are highly decadent and heavily used. The south-facing slope is moderately steep (35%). North-facing slopes in the area support more and healthier browse, attesting to the effects of the prolonged drought. There is some mountain mahogany recruitment with the young age class accounting for 13% of the population. The low density sagebrush population has canopy cover averaging only 2%. Undesirable woody species make up the vast majority of the browse composition. Broom snakeweed has increased by 31%. Junipers have an estimated density of 78 trees/acre. Indian ricegrass shows an increase in nested frequency with moderate utilization. There was a 78% increase in the amount of erosion pavement.

TREND ASSESSMENT
soil - downward (1)
browse - downward due to density losses for key browse species and large increase for broom snakeweed (1)
herbaceous understory - slightly improving with increased nested frequencies for Indian ricegrass and Sandberg bluegrass (4)

1996 TREND ASSESSMENT

The trend for soil is stable. Percent bare ground declined to less than 18%. Vegetation and litter cover are moderate and adequately distributed to prevent heavy erosion. The trend for the two preferred browse species is down. The proportion of the population made up of dead plants is high at 56% for mountain big sagebrush and 29% for true mountain mahogany. Percent decadency for sagebrush is also high at 62%. Mahogany is showing some improvement with only about 20% decadency, but its density is down to only 300 plants/acre. This is one of the few sites where dead mahogany was sampled. You can usually have a moderately high percent decadency, but usually no significant number of dead plants. The only real positive note for this site is that the population of broom snakeweed has decreased by 97%. The herbaceous understory (perennial component) is also down for both the grasses and forbs where most of the herbaceous cover is from annuals.

TREND ASSESSMENT
soil - stable (3)
browse - continuing downward (1)
herbaceous understory - down (1)

HERBACEOUS TRENDS --
Herd unit 06 , Study no: 6

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %
		'84	'90	'96	'84	'90	'96	'96
G	Agropyron dasystachyum	-	-	3	-	-	1	.03
G	Agropyron spicatum	$_{a}$29	$_{a}$27	$_{b}$64	13	12	28	1.64
G	Bromus tectorum (a)	-	-	269	-	-	85	6.09
G	Elymus cinereus	-	-	6	-	-	2	.53
G	Oryzopsis hymenoides	$_{b}$86	$_{b}$116	$_{a}$29	44	47	15	1.04
G	Poa bulbosa	-	-	3	-	-	1	.00
G	Poa fendleriana	-	-	1	-	-	1	.15
G	Poa secunda	$_{a}$18	$_{b}$58	$_{b}$69	7	25	29	1.97
Total for Annual Grasses		0	0	269	0	0	85	6.09
Total for Perennial Grasses		133	201	175	64	84	77	5.38
Total for Grasses		133	201	444	64	84	162	11.48
F	Alyssum alyssoides (a)	-	-	252	-	-	77	2.32
F	Artemisia ludoviciana	$_{b}$21	$_{b}$17	$_{a}$-	9	6	-	.03
F	Camelina microcarpa (a)	-	-	1	-	-	1	.00
F	Calochortus nuttallii	-	5	-	-	2	-	-
F	Chenopodium album (a)	-	-	1	-	-	1	.00
F	Chaenactis douglasii	$_{a}$9	$_{b}$53	$_{a}$3	7	27	3	.01
F	Cirsium undulatum	$_{ab}$9	$_{b}$17	$_{a}$5	5	10	2	.04
F	Comandra pallida	$_{ab}$6	$_{a}$1	$_{b}$11	3	1	4	.07
F	Cryptantha spp.	6	16	8	3	6	4	.02
F	Cynoglossum officinale	1	-	-	1	-	-	-
F	Erigeron pumilus	-	-	8	-	-	3	.01
F	Hackelia patens	6	12	11	3	5	5	.02
F	Holosteum umbellatum (a)	-	-	1	-	-	1	.00
F	Machaeranthera canescens	1	2	-	1	1	-	-
F	Oenothera caespitosa	$_{ab}$8	$_{b}$13	$_{a}$-	3	6	-	-
F	Phlox austromontana	-	-	2	-	-	1	.00
F	Phlox longifolia	-	2	-	-	2	-	-
F	Ranunculus testiculatus (a)	-	-	13	-	-	4	.02
F	Tragopogon dubius	2	1	-	1	1	-	-
Total for Annual Forbs		0	0	268	0	0	84	2.35
Total for Perennial Forbs		69	139	48	36	67	22	0.22
Total for Forbs		69	139	316	36	67	106	2.57

Values with different subscript letters are significantly different at alpha = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 06 , Study no: 6

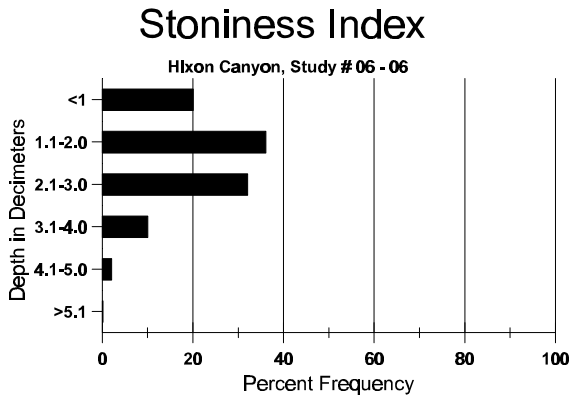
Type	Species	Strip Frequency '96	Average Cover % '96
B	Amelanchier alnifolia	2	.03
B	Artemisia tridentata vaseyana	10	.25
B	Cercocarpus montanus	15	2.93
B	Chrysothamnus viscidiflorus viscidiflorus	3	.03
B	Gutierrezia sarothrae	11	.32
B	Juniperus osteosperma	8	7.08
B	Opuntia spp.	19	.16
B	Quercus gambelii	2	1.63
B	Symphoricarpos oreophilus	1	.18
Total for Browse		71	12.62

BASIC COVER --
Herd unit 06 , Study no: 6

Cover Type	Nested Frequency '96	Average Cover % '84	'90	'96
Vegetation	350	2.75	7.00	28.37
Rock	290	21.00	23.00	15.63
Pavement	258	4.00	18.25	10.17
Litter	388	33.25	20.50	39.14
Cryptogams	17	0	0	.09
Bare Ground	268	39.00	31.25	17.65

SOIL ANALYSIS DATA --
Herd Unit 06, Study no: 06, Hixon Canyon

Effective rooting depth (in)	Temp °F (depth)	PH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
11.3	66.3 (12.4)	7.9	46.9	25.1	28.0	1.7	9.7	19.2	.5



PELLET GROUP FREQUENCY --
Herd unit 06 , Study no: 6

Type	Quadrat Frequency '96
Rabbit	18
Elk	3
Deer	17
Cattle	1

BROWSE CHARACTERISTICS --
Herd unit 06 , Study no: 6

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Amelanchier alnifolia																		
M	84	-	-	2	-	-	-	-	-	-	2	-	-	-	66	30	30	2
	90	-	-	2	-	-	-	-	-	-	2	-	-	-	66	39	31	2
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20	24	24	1
D	84	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	1	-	-	-	-	-	-	-	1	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	100%	00%	-33%
'90	00%	100%	00%	-39%
'96	50%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	99	Dec:	33%
	'90	66		0%
	'96	40		50%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata vaseyana																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
M	84	-	2	5	-	-	-	-	-	-	7	-	-	-	233	21	28	7
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33	14	43	1
	96	2	3	-	-	-	-	-	-	-	5	-	-	-	100	18	32	5
D	84	-	-	16	-	-	-	-	-	-	14	-	-	2	533			16
	90	1	1	1	-	-	-	-	-	-	1	-	-	2	100			3
	96	3	4	1	-	-	-	-	-	-	6	-	-	2	160			8
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	320			16

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	09%	91%	09%	-78%
'90	20%	20%	40%	+36%
'96	54%	08%	15%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	766	Dec:		70%
'90	166			60%
'96	260			62%

Cercocarpus montanus																		
Y	84	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	90	-	1	1	-	-	-	-	-	-	2	-	-	-	66			2
	96	1	1	1	-	-	-	-	-	-	3	-	-	-	60			3
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	2	-	-	-	-	-	-	1	1	-	-	66	22	31	2
	96	-	1	8	-	-	-	-	-	-	9	-	-	-	180	23	34	9
D	84	-	-	14	-	-	-	-	-	-	14	-	-	-	466			14
	90	-	-	11	-	-	-	-	-	-	2	-	4	5	366			11
	96	-	1	2	-	-	-	-	-	-	2	-	-	1	60			3
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	120			6

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	93%	00%	- 0%
'90	07%	93%	60%	-40%
'96	20%	73%	07%	

Total Plants/Acre (excluding Dead & Seedlings)				
'84	499	Dec:		93%
'90	498			73%
'96	300			20%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Chrysothamnus viscidiflorus viscidiflorus																		
M	84	4	-	3	-	-	-	-	-	-	7	-	-	-	233	20	18	7
	90	9	-	-	1	-	-	-	-	-	6	-	4	-	333	19	27	10
	96	3	-	-	-	-	-	-	-	-	3	-	-	-	60	11	19	3
D	84	-	-	2	-	-	-	-	-	-	2	-	-	-	66			2
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	56%	00%	+18%
'90	00%	00%	45%	-84%
'96	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	299	Dec:	22%
	'90	366		9%
	'96	60		0%

Gutierrezia sarothrae																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	11	-	-	-	-	-	-	-	-	11	-	-	-	366			11
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	97	-	-	-	-	-	-	-	-	97	-	-	-	3233			97
	90	445	-	-	-	-	-	-	-	-	445	-	-	-	14833			445
	96	14	-	-	-	-	-	-	-	-	14	-	-	-	280			14
M	84	363	-	-	-	-	-	-	-	-	363	-	-	-	12100	9	9	363
	90	213	1	-	3	-	-	-	-	-	216	-	1	-	7233	9	10	217
	96	23	-	-	-	-	-	-	-	-	23	-	-	-	460	7	13	23
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	8	-	-	-	-	-	-	-	-	4	-	-	4	266			8
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	+31%
'90	.14%	00%	.74%	-97%
'96	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	15333	Dec:	0%
	'90	22332		1%
	'96	740		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Juniperus osteosperma																		
M	84	2	-	-	2	-	-	-	-	-	4	-	-	-	133	60	48	4
	90	2	-	-	1	-	-	-	-	-	3	-	-	-	100	71	56	3
	96	4	-	2	-	-	-	2	-	-	8	-	-	-	160	-	-	8
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-25%
'90	00%	00%	00%	+38%
'96	00%	25%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	133	Dec:	-
	'90	100		-
	'96	160		-

Opuntia spp.																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	1	-	-	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	84	4	-	-	-	-	-	-	-	-	4	-	-	-	133			4
	90	6	-	-	1	-	-	-	-	-	7	-	-	-	233			7
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	15	-	-	-	-	-	-	-	-	15	-	-	-	500	6	7	15
	90	6	-	-	1	-	-	-	-	-	6	-	1	-	233	4	8	7
	96	26	1	-	-	-	-	-	-	-	23	1	1	2	540	6	16	27
D	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
X	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	-21%
'90	00%	00%	13%	+11%
'96	04%	00%	11%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	633	Dec:	0%
	'90	499		7%
	'96	560		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Quercus gambelii																		
M	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	96	-	-	-	-	-	-	7	-	-	7	-	-	-	140	-	-	7

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	00%	00%	00%	
'90	00%	00%	00%	
'96	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	0	Dec:	-
	'90	0		-
	'96	140		-

Symphoricarpos oreophilus																		
S	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
Y	84	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	90	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	96	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	84	-	1	-	-	-	-	-	-	-	1	-	-	-	33	19	17	1
	90	7	-	-	-	-	-	-	-	-	-	-	7	-	233	23	24	7
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0	17	37	0
D	84	-	-	1	-	-	-	-	-	-	1	-	-	-	33			1
	90	1	-	-	-	-	-	-	-	-	-	-	1	-	33			1
	96	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'84	50%	50%	00%	+75%
'90	00%	00%	100%	-92%
'96	00%	00%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'84	66	Dec:	50%
	'90	266		12%
	'96	20		0%